Installing Application Manager

Application Manager 1.5

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Installing and Configuring Application Manager 1

This information describes how to install Application Manager, the on-premise appliance as opposed to the hosted version of Application Manager. When you host Application Manager, you control the operator and administrator pages that allow you to manage end-user access to your Windows, SaaS, and Web applications. The Connector is a required software piece that you must install separately.

Intended Audience

This information is intended for organization administrators. The information is written for experienced Windows and Linux system administrators who are familiar with VMware virtual machine technology, identity management, entitlement, and directory services. SUSE Linux is the underlying operating system of the Application Manager virtual appliance. Knowledge of Linux is essential to configure the Application Manager directly and to perform system-level functions, such as configuring network settings, time settings, and log files. Knowledge of other technologies, such as VMware ThinApp and RSA SecurID, is helpful if you plan to implement those features.

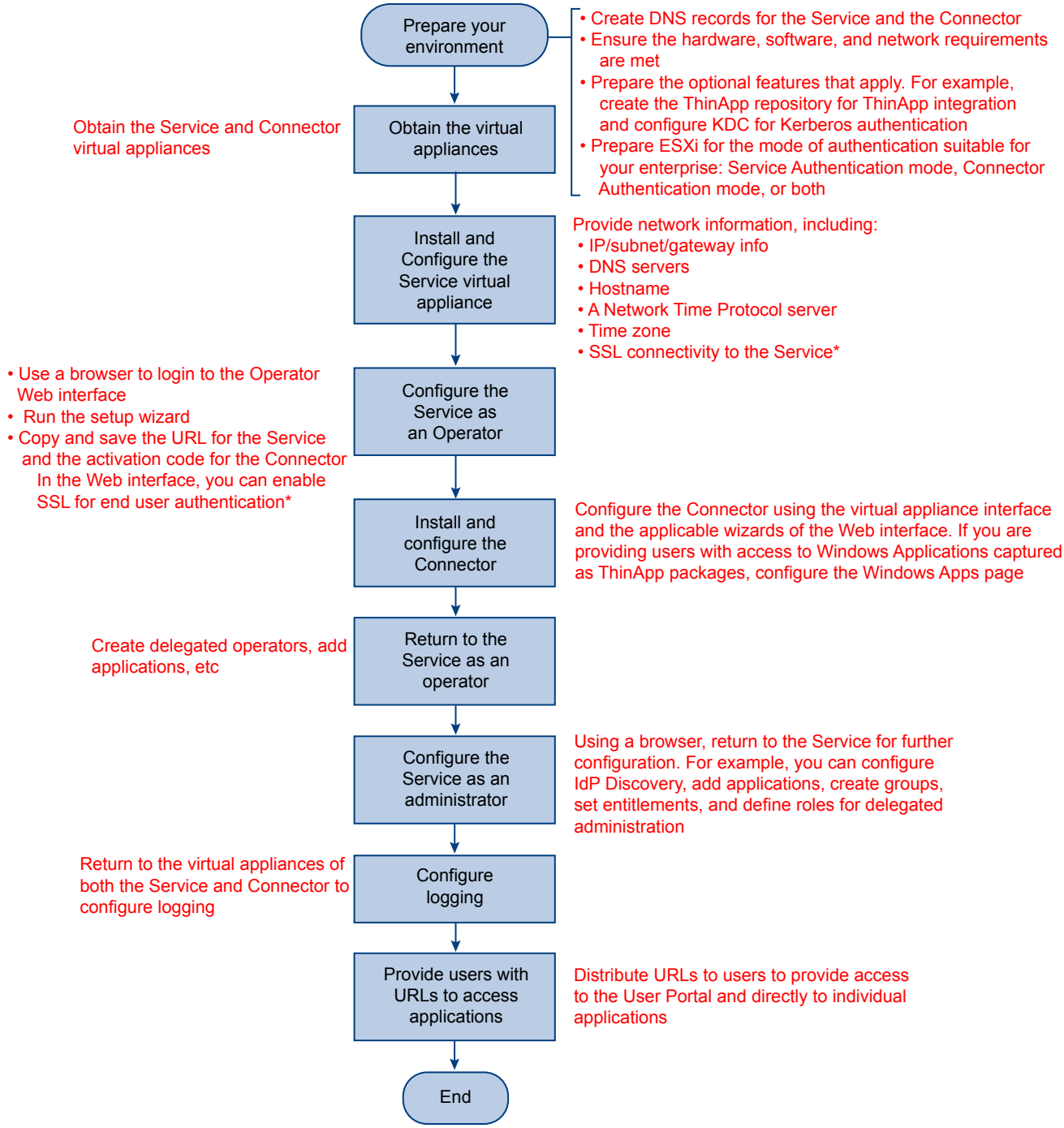
Application Manager Installation Overview

This process involves a variety of tasks and you can deploy the Application Manager in several different ways. A key distinction in deployments is in the mode of authentication you choose. See Chapter 2, "Introduction to Application Manager," on page 11. An important deployment factor depends on if you choose to provide Application Manager users with access to Windows applications captured as ThinApp packages. See *Installing and Configuring the Connector* for more information.

Installation and Configuration Flow of an Application Manager Deployment

Figure 1-1 provides a broad overview of the installation and configuration tasks involved in an on-premise Application Manager deployment. The summary that follows reiterates the main steps.

Figure 1-1. Application Manager Installation and Configuration Flowchart



*NOTE: SSL connectivity to the Service and the Connector is disabled by default to simplify the configuration of your Application Manger deployment during the proof-of-concept phase. You can enable SSL later when you are prepared to put Application Manager into production. Verify that the state of SSL, enabled or disabled, always matches between the Connector and the Service.

After you enable SSL for your Application Manager deployment, perform the following tasks that apply:

- If you are providing users with access to Windows Applications captured as ThinApp packages, reinstall the Horizon Agent on each user's system to update the Service URL from HTTP to HTTPS.
- Update each SAML application that you previously configured without SSL to now use SSL. Therefore, ensure that each SAML application now reaches Application Manager using HTTPS instead of HTTP. This might involve working with account administrators for specific applications.

1 Prepare your environment:

- Create DNS records for Application Manager and the Connector.
- Ensure hardware and software requirements are met.
- Prepare the optional features that apply. For example, create the ThinApp repository for ThinApp integration and configure KDC for Kerberos authentication.
- Prepare vSphere for Connector Authentication mode.

2 Obtain virtual appliances:

- Obtain the Application Manager and Connector virtual appliances.

3 Install and configure the Application Manager virtual appliance:

- Provide network information, including:
  - IP/subnet/gateway info
  - DNS servers
  - Hostname
  - A Network Time Protocol server
  - Time zone
  - SSL connectivity to Application Manager

4 Configure Application Manager as an operator:

- Use a browser to log in to the Operator Web interface.
- Run the setup wizard to create your first organization.
- Copy and save the URL for Application Manager and the activation code for the Connector.

5 Install and configure the Connector:

- Configure the Connector using the virtual appliance interface and the applicable wizards of the Web interface. If you are providing users with access to Windows Applications captured as ThinApp packages, configure Windows Apps in the Connector setup wizard. You can also perform additional configuration such as setting up RSA SecurID.
- In the Web interface, you can enable SSL for end user authentication.

6 Return to Application Manager as an operator of your first organization:

- Create delegated operators, add applications, additional organizations, etc.

7 Configure Application Manager as an administrator:

- Using a browser, return to Application Manager for further configuration. For example, you can add ThinApp packages, configure IdP Discovery for ThinApp integration, add applications, create groups, set entitlements, and define roles for delegated administration.

8 Configure logging:

- Configure logging for Application Manager. Return to the Connector virtual appliance interface to configure logging for the Connector.

9 Provide users with URLs to access applications:

- Distribute URLs to users to provide access to the User Web interface and directly to individual applications

Trial, Test, and Production Deployment Phases

To reduce the complexity of the deployment process, you might want to deploy Application Manager in phases.

SSL connectivity, load balancing, and high availability add layers of complexity to your deployment that can be avoided during the proof-of-concept phase.

By default, secure ports are disabled for the Connector and Application Manager. For the proof-of-concept phase, you can install the Connector and Application Manager using the default insecure ports. This frees you during this phase from managing SSL certificates.

Also, by default, Application Manager uses an internal database server. To support load balancing or high availability you must install and configure a supported external database server and point multiple Application Manager instances to that external database server. For the proof-of-concept phase, you can use the default internal database server. This frees you from installing an external database server and configuring clustering.

Table 1-1. Recommended Phases of Deployment

Phase	Recommended Actions
Trial (Proof-of-Concept)	■ SSL Connectivity (Do not configure) ■ For Application Manager, keep the insecure ports enabled and the secure ports disabled. These settings are accessible with the Application Manager virtual appliance interface, on the Configure Web Server screen. ■ For the Connector, accept the default insecure mode. This setting is accessible with the Connector virtual appliance interface, on the Configure Web Server screen. **NOTE** You can test ThinApp integration in Insecure mode. ■ Load Balancing and High Availability (Do not configure) ■ For Application Manager, keep the internal database server configuration. This setting is accessible with the Application Manager virtual appliance interface, on the Configure Database Connection screen.
Test (Pre-Production)	■ SSL Connectivity ■ For Application Manager, disable the insecure ports and enable the secure ports. ■ For the Connector, enable secure mode, which requires you to reset and reconfigure the Connector. ■ Generate both an Application Manager SSL certificate and a Connector SSL certificate. ■ If you are using self-signed SSL certificates, deploy the certificates to user machines. In addition, distribute the Application Manager certificate to each Connector instance. ■ Reconfigure SAML applications to use HTTPS instead of HTTP. ■ Reinstall the Horizon Agent on user machines to use HTTPS instead of HTTP. ■ Load Balancing and High Availability ■ For Application Manager, install a supported external database server and point multiple Application Manager instances to that external database server.
Production	■ SSL Connectivity ■ Replace your self-signed SSL certificates with signed third-party CA certificates. ■ For Application Manager, verify that insecure ports are disabled and secure ports are enabled. ■ For the Connector, verify that secure mode is enabled. ■ Verify that SAML applications are configured for HTTPS. ■ Verify that the Horizon Agent has been reinstalled on user machines to use HTTPS. ■ Load Balancing and High Availability ■ For Application Manager, install a supported external database server and point multiple Application Manager instances to that external database server.

Application Manager Deployment Checklists

You can use the Application Manager Deployment Checklist to gather the necessary information to install Application Manager on premise.

Network Information for Application Manager

Table 1-2. Application Manager Network Checklist

Information to Gather	List the Information
IP Address	
Subnet Mask	
Gateway	
DNS Server	

Network Information for the Connector

Table 1-3. Connector Network Checklist

Information to Gather	List the Information
IP Address	
Subnet Mask	
Gateway	
DNS Server	

DNS Record for Application Manager

Table 1-4. Application Manager DNS Checklist

Information to Gather	List the Information
Application Manager Host (*MyHost.MyDomain.com*) The best practice is to use the same name for *MyHost* that you plan to use for your first organization.	
First Organization (*MyOrg.MyDomain.com*) When you configure Application Manager, organizations are created within logical/functional containers for users and applications.	

DNS Record for the Connector

Table 1-5. Connector DNS Checklist

Information to Gather	List the Information
Connector Host	

Active Directory Domain Controller

Table 1-6. Active Directory Domain Controller Checklist

Information to Gather	List the Information
Active Directory IP Address	
Active Directory FQDN	

Introduction to Application Manager 2

Application Manager is an identity and access management service or virtual appliance that unifies your software as a service (SaaS) applications and Windows applications (captured as ThinApp packages) into a single catalog for entitlement.

Table 2-1. Application Manager Component Terminology

Application Manager Component	Other Terms Used	Description
Application Manager deployment	■ None	The entire Application Manager deployment, including Application Manager, the Connector, the related interfaces to access those components, and all other components necessary to enable users to access applications.
Application Manager ■ Application Manager ■ Application Manager Appliance	None ■ hosted service ■ on-premise appliance	Two versions of Application Manager exist: the hosted service and the on-premise virtual appliance. As a generalization, both versions are referred to as the service. If you have the hosted service, it is maintained for you. If you have the on-premise appliance, you install and maintain it yourself. Application Manager stores entitlement, SaaS, policy, and ThinApp package information and communicates with your Connector instances to access Active Directory information.
Application Manager virtual appliance interface	■ virtual appliance interface	The interface of the Application Manager virtual appliance. You use this interface to perform the initial configuration of Application Manager on premise. You also use this interface to access the command-line interface of the underlying Linux operating system.
Application Manager Operator Web interface	■ Operator Web interface	The browser-based interface of the on-premise version of Application Manager that individuals with operator privileges access to manage organizations and the Operator application catalog. Application Manager provides multi-tenancy. This interface provides an overview of all the organizations managed by Application Manager.

Table 2-1. Application Manager Component Terminology (Continued)

Application Manager Component	Other Terms Used	Description
Application Manager Administrator Web interface	■ Administrator Web interface	The browser-based interface of Application Manager that you, as an administrator of a specific organization, use to manage user access and entitlements to SaaS and ThinApp-packaged applications. This interface provides an overview of a single organization.
Application Manager User Web interface	■ Workspace ■ User Web interface	The browser-based interface of Application Manager that users access to use SaaS or ThinApp-packaged applications. This interface includes the User Portal, which provides users easy access to applications.
Application Manager internal database server	■ internal database server	The default database server, vPostgres 9.1, that ships with the on-premise version of Application Manager. You can use this internal database server during the proof-of-concept phase of deployment. For production, you should disable the internal database server and use a supported external database server, such as PostgreSQL 9.1.
Application Manager Operator application catalog	■ Operator application catalog ■ Operator catalog	The master catalog of applications, which is accessible using the operator Web interface. Operators can create application in this catalog. Operators can assign applications to all organizations in the system or only to specific organizations.
Application Manager Administrator application catalog ■ Administrator source application catalog ■ Administrator active application catalog	■ Administrator application catalog ■ Administrator catalog	A catalog of applications accessible using the Administrator Web interface. You, as an organization administrator, manage the applications assigned to you by operators. To make applications available to users, you must move them from the Administrator source application catalog to the Administrator active application catalog.
Application Manager User application catalog	■ User application catalog ■ User catalog	A catalog of applications accessible using the User Web interface. Users access and use the applications assigned to them by you as an organization administrator.
Connector	■ Connector Appliance ■ Connector instance	The virtual appliance you install in your enterprise network to connect Application Manager to Active Directory and to the ThinApp package repository.
Connector virtual appliance interface	■ None	The interface of the Connector virtual appliance. You use this interface to make the initial configurations of the Connector. You also use this interface to access the command-line interface of the underlying Linux operating system.

Table 2-1. Application Manager Component Terminology (Continued)

Application Manager Component	Other Terms Used	Description
Connector Web interface	■ None	The browser-based interface you use to configure and manage the Connector after using the Connector virtual appliance to make the initial Connector configurations.
ThinApp Repository	■ Windows applications network share	A shared folder that you create to store Windows applications captured as ThinApp packages. You then provide users access to these applications.
Horizon Agent	■ Agent	A ThinApp-specific component installed on user's Windows systems that allows users to access Windows applications captured as ThinApp packages.

Flow of Applications Through the Various Application Manager Catalogs

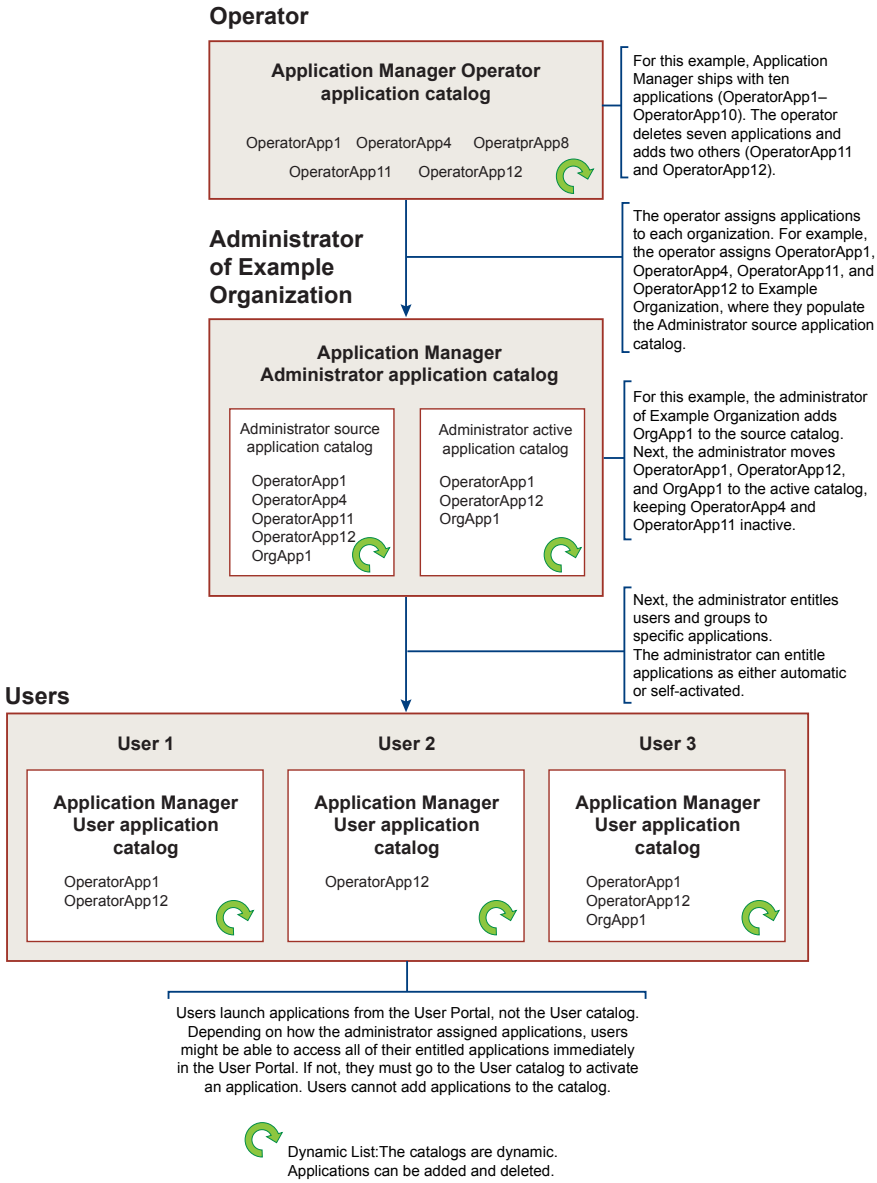
Applications move through a hierarchy of Application Manager catalogs before appearing in a user's User Portal, where the user can launch them.

1 The Application Manager Appliance ships with a set of default applications available in the Operator application catalog. Operators then customize the Operator application catalog by adding and deleting applications. They can make specific applications available to each organization, which places the application in organizations' Administrator source application catalog. Operators can make applications public (available to all organizations) or private (available to only specified organizations).

2 When organization administrators initially access their organization's catalog, they access the Administrator source application catalog, which was prepopulated by the operator. Administrators can add applications not provided by operators. Next, administrators move the applications from the Administrator source application catalog to the Administrator active application catalog. By adding group and individual user entitlements, administrators entitle specific applications to specific users. Administrators can entitle applications as automatic or self-activated.

3 When users access the Application Manager User Web interface, their Workspace, they see the User Portal and an Application Catalog link. The application catalog lists all applications to which users are entitled. Unless the administrator made an application automatically available, users must activate each application in the User application catalog that they want to use. Activating an application moves it to the User Portal where the user can launch it.

Figure 2-1. Application Manager Application Catalogs



Application Manager Authentication Modes

Application Manager facilitates username and password validation by using your Active Directory server on site. You install the Connector as a virtual appliance that communicates with your local directory using LDAP. You can use LDAP over SSL.

The Connector can operate in two different modes: Connector Authentication mode or Service Authentication mode. You can also combine both modes in one deployment. However, the Application Manager Appliance only supports Connector authentication mode. Service Authentication mode is supported for the Application Manager hosted service. The modes of authentication indicate the flow of user authentication to access Application Manager.

In Connector Authentication mode, once users are logged in to the internal network, they are usually not prompted for their credentials when attempting to access the Application Manager. In specific situations where users are prompted for their credentials to access Application Manager, the Connector presents the login page.

Application Manager User Authentication

Connector Authentication mode refers to access to Application Manager where the Connector is the starting point for user authentication.

Table 2-2. Providing User Access to Application Manager in Connector Authentication Mode

User Access From Inside the Enterprise Network	User Access From Outside the Enterprise Network
■ Configure Kerberos authentication or username/password authentication.	■ Install both the Application Manager and Connector virtual appliances in a manner that provides Internet access. Kerberos authentication is not available outside the network. Therefore, the best practice is to use RSA SecurID authentication, though username/password authentication is available as well. ■ You can install the Connector and Application Manager virtual appliances without Internet access. However, to provide user access from outside the enterprise network, users will need a VPN connection.

If you decide to enable Internet access to Application Manager and the Connector to provide users outside the enterprise network access to Application Manager, configure them in one of the following ways:

- Install Application Manager and the Connector inside the DMZ.
- Install a reverse proxy server in the DMZ pointing to Application Manager and the Connector installed behind the firewall.
- Configure firewall port forwarding or router port forwarding to point to Application Manager and the Connector installed behind the firewall.

For Connector Authentication mode, if you do not configure IdP discovery, you must provide users access to specific URLs that direct the authentication flow through the Connector. These URLs contain the appropriate information to direct users through the Connector directly to Application Manager. You must provide users access to such URLs.

IMPORTANT Configuring IdP discovery eliminates the need to use the long URLs provided in the following table. See "IdP Discovery," on page 17.

Table 2-3. Connector Authentication Mode: URL Examples

Target	URL Example	Information
The Application Manager User Web Interface	https://*MyOrg*.*MyDomain*.com/SAAS/API/1.0/GET/federation/request?i=*IDP#*&s=0	When your deployment is production ready, provide this URL to users to give them access to the User Web interface. Replace *MyOrg* and *MyDomain* with the appropriate values and replace *IDP#* with the IdP ID available on the Connector Internal Access page.
	https://*ConnectorHost*.*MyDomain*/login/	Use this URL for testing and troubleshooting purposes if Kerberos is not configured. Replace *ConnectorHostConnectorHost* and *MyDomain* with the appropriate values.

Table 2-3. Connector Authentication Mode: URL Examples (Continued)

Target	URL Example	Information
	https://*ConnectorHost*.*MyDomain*/authenticate/	Use this URL for troubleshooting and testing purposes if Kerberos is configured. Replace *ConnectorHost* and *MyDomain* with the appropriate values.
Specific Applications	https://*MyOrg*.*MyDomain*.com/SAAS/API/1.0/GET/federation/request?i=*IDP#*&s=*SP#*	When your deployment is production ready, provide this URL to users to give them one-click access to a specific application. Replace the placeholders. For example, replace *SP#* with the ID number for a specific application. The application ID numbers are available from the Application Manager User application catalog.

For deployments where Kerberos is configured, the Connector validates user desktop credentials using Kerberos tickets distributed by the key distribution center (KDC).

In Connector Authentication mode, the Connector acts as a federation server within your network, creating an in-network federation authority that communicates with Application Manager using SAML 2.0 assertions. The Connector authenticates the user with Active Directory within the enterprise network (using existing network security).

A troubleshooting-related aspect of Connector Authentication mode is that users can still be authenticated even when Kerberos fails. In fact, users can still be authenticated when Kerberos is not configured. In such cases, an Application Manager redirect takes place causing the Connector to present users with a login page. This Connector-supplied login page prompts users to provide their usernames and passwords again for access to Application Manager. The Connector then validates users against Active Directory.

Connector Authentication Mode and RSA SecurID

After you install the Connector in Connector Authentication mode, you can configure SecurID to provide additional security. For an overview of using RSA SecurID with the Connector, see *Installing and Configuring the Connector*.

You can configure SecurID with or without Kerberos. However, the most common use case is to use SecurID to authenticate users outside the enterprise network, while Kerberos authentication is not available outside the network. See "IdP Discovery," on page 17 for more information about configuring two Connector instances, one instance for users inside the enterprise network and the other for users outside the network.

RSA SecurID with	Result
Kerberos configured	Kerberos authentication takes precedence. Users are only prompted for their SecurID passcode if Kerberos authentication fails.
username-password verification as part of Connector Authentication mode	SecurID takes precedence and username password verification is disabled. Users are prompted for their SecurID passcode. They are never prompted for their Active Directory credentials.

For various reasons, both intentional and unintentional, Kerberos authentication might not function. For example, you might intentionally prevent specific users from accessing the enterprise network. Also, non-Windows machines do not support Kerberos authentication. When Kerberos and SecurID are both configured, but Kerberos authentication fails, users are prompted for their SecurID passcode.

IdP Discovery

You configure the IdP Discovery feature using the Application Manager Administrator Web interface. See *Application Manager Administration Help*. The IdP Discovery feature works in conjunction with Connector Authentication mode. IdP Discovery refers to the discovery of identity providers. The Connector acts as an identity provider. Therefore, even though users access a URL directly to Application Manager, such as https://*MyOrg*.*MyDomain*.com, when IdP Discovery is properly configured, it finds (discovers) and redirects users to the specific Connector instance. With a single URL, you can provide all users access to the User Web Interface.

For the IdP Discovery feature to function, you must configure IP address ranges in Application Manager. When you have multiple Connector instances, the order in which the corresponding Connector records are listed in Application Manager is important if the IP ranges overlap. In such cases, the first Connector record to include an IP address is given precedence.

CAUTION When you remove or reset a Connector instance, you must remove the corresponding Connector record from the list of Connector records accessible with the Application Manager Administrator Web interface.

The IdP Discovery feature typically applies when users attempt to access Application Manager from inside the enterprise network and when they are on the same domain as the Active Directory instance.

When users within the specified IP address ranges access the provided URL, their request is processed in Connector Authentication mode and the request is redirected to the Connector. Assuming that Kerberos is configured, a SAML assertion generated by the Connector is used for authentication and users are granted access to the User Web interface without being prompted for their username and password. If Kerberos is not configured, users must provide their username and password on the Connector login page to gain access. When users outside the specified IP address range use the provided URL, their request is processed in Service Authentication mode, if you have it enabled, requiring them to provide their username and password on the Application Manager login page to gain access.

You can configure your Application Manager deployment with IdP Discovery in a variety of ways, one of which is summarized in the example that follows.

External RSA SecurID and Internal Kerberos Authentication Example of IdP Discovery

This is one possible way to configure IdP Discovery and SecurID in the same Application Manager deployment. For an overview of configuring RSA SecurID with the Connector, see *Installing and Configuring the Connector*. For this deployment, you configure two Connector instances, both in Connector Authentication mode.

- Internal - First Connector instance in Connector Authentication mode: You do not configure SecurID for this Connector instance. In Application Manager, you configure IP address ranges to include users within the enterprise network.
- External - Second Connector instance in Connector Authentication mode: You configure SecurID for this Connector instance. In Application Manager, you configure a single IP address range that includes all possible users. Therefore, you set the IP address range from 0.0.0.0 to 255.255.255.255.

The result of this configuration is that users attempting to access the User Portal are authenticated in Connector Authentication mode. Users inside the enterprise network are authenticated by Kerberos or username/password authentication. Users outside the enterprise network are authenticated by SecurID authentication.

ThinApp Packages

ThinApp package access requires Connector Authentication mode. See *Installing and Configuring the Connector* for information about integrating the Connector with ThinApp.

Evaluation and Quick Access to Application Manager

For evaluation purposes, you can access the User Portal as an administrative user with minimum configuration. This quick-access configuration works in Connector Authentication mode only. Using the Connector Web interface, you run the initial configuration wizard, stopping before running the setup wizard. The initial configuration wizard requires you to provide your activation code and information for Active Directory. The Active Directory information is not used for Directory Sync because quick-access configuration does not enable directory synchronization. The Active Directory information is required for the following purposes:

- To establish a connection to Active Directory, which is used to verify your administrative user credentials when you attempt to log in to Application Manager.
- To allow you to log in to the Application Manager. You use the username associated with the Bind DN user account and respective password as the credentials to log in to Application Manager as an administrator.

With quick-access configuration, you cannot configure Kerberos authentication, nor can you access Windows applications captured as ThinApp packages. Also, with the quick-access configuration, you can use the default internal database, instead of configuring an external database. The purpose of quick-access configuration is to provide easy access to the basic functionality of Application Manager, which you can evaluate.

Application Manager Database

Application Manager stores information, such as user information, application entitlements, and policies in an internal database that runs directly in the Application Manager virtual appliance.

IMPORTANT During the proof-of-concept phase, you can use the internal database server. Do not use the internal database server in production. For production, install and configure an external database server.

To support high availability and load balancing of Application Manager instances, you must configure a connection from each Application Manager instance to a shared external database server. See "Configure an External Database Connection," on page 41. When you switch to an external database server and use multiple Application Manager instances, you make Application Manager highly available. Making the external database server highly available is outside the scope of this document. Refer to the database product documentation for more information.

Security Considerations and System Requirements for Application Manager

3

When you install and configure Application Manager, you install the Application Manager virtual appliance and use both the Application Manager virtual appliance interface and the Application Manager Web interface for configuration purposes. You must manage the Web interface with care to avoid security issues.

Consider the Application Manager system requirements within the context of the following security concerns:

- The Application Manager virtual appliance interface is accessible to anyone with access to the machine on which vSphere and the virtual appliance are hosted. Protection relies on firewalling and enforcing authentication to the vSphere host.
- The Application Manager Web interface listens on HTTP ports 8443 for administration and port 443 for user authentication.

  Insecure mode 8080 for operation and administration and 80 for user authentication.

  Secure mode 8443 for operation and administration and 443 for user authentication.

For quick trials and tests, you can use Insecure mode. For pre-production testing and production, you should switch to Secure mode.

Application Manager Recommendations and Requirements

To synchronize your Active Directory data effectively with Application Manager, ensure that the environment for the Application Manager virtual appliance meets the minimum requirements.

The following components are required:

- The Application Manager virtual appliance that VMware provides as an Open Virtual Appliance `.ova` file.
- VMware vSphere as the host of the virtual appliance. See the release notes for the currently supported vSphere versions.
- A virtual machine client, such as vSphere Client, that provides access to Application Manager virtual appliance interface. This client is required to deploy the .ova file to vSphere and to access the deployed virtual appliance remotely in order to configure networking.
- The appropriate VMware licenses.
- A conversion tool, if your VMware hypervisor does not open OVA files directly. VMware offers a free tool for Windows and Linux. See "Convert the Virtual Appliance File Format," on page 24.

You must consider your entire Application Manager deployment. Therefore, consider how you are integrating the Connector with Application Manager when you make decisions about hardware, resource, and network requirements. See *Installing and Configuring the Connector*.

Hardware Requirements for the Application Manager Virtual Appliance Host

Ensure that the environment for the host, the vSphere instance, to run the Application Manager virtual appliance meets the minimum hardware requirements.

Table 3-1. Minimum Application Manager Hardware Requirements

Component	Minimum Requirement
Processor	One Intel Xeon Dual Core, 3.0GHz, 4MB Cache
RAM	6GB DDR2 667 MHz, ECC and registered
On-board LAN	One 10/100/1000Base-TX port
Storage	32GB

Resource Requirements and Recommendations for the Application Manager Virtual Appliance

Ensure that the resources allocated to the Application Manager virtual appliance meet the minimum requirements.

IMPORTANT In reference to storage, you can use the internal database for the proof-of-concept phase. Do not use the internal database server in production. For production, install and configure an external database server.

Table 3-2. Application Manager Resource Requirements and Recommendations

Component	Required	Recommended
Processor	2 vCPU	4 vCPU for higher performance
Random-access memory	4GB	4GB
Storage	32GB	External database sizing information: 64GB for first 100,000 users. Add 20GB for each additional 100,00 users

Network Configuration Requirements for the Application Manager Virtual Appliance

For the Application Manager virtual appliance is specific to configuring a Network Time Protocol (NTP) server.

Table 3-3. Network Configuration Requirements

Network Requirements
Access to a Network Time Protocol (NTP) server made available in one of the following ways: ■ To allow Application Manager to access an external NTP server, you must ensure that the outbound firewall port 123 (NTP Protocol) is opened from Application Manager to the Internet. ■ If you do not want a firewall port open for the NTP server, you must ensure that the NTP configuration is pointing to an internal NTP server. You perform this action when you configure the Application Manager using the Application Manager virtual appliance interface.
Inbound firewall port 443 opened from users outside the enterprise network to Application Manager.

System Requirements for User Systems Running the Horizon Agent

This requirement applies when Application Manager provides ThinApp Package access. If users run the Horizon Agent from their systems, ensure that users' systems meet the minimum requirements.

Table 3-4. User System Requirements

Component	Required
Random-access memory	1GB

Preparing to Install Application Manager

4

Preparing to install the Application Manager involves creating the DNS name; obtaining the Application Manager virtual appliance; and configuring the hardware, resource, and network settings of the Application Manager host. Other preinstallation tasks might be required depending on the specifics of your deployment.

This chapter includes the following topics:

Prepare to Install Application Manager

You must prepare your environment for the installation of Application Manager.

Prerequisites

- Plan your Application Manager deployment, deciding how to integrate the Connector. See *Installing and Configuring the Connector*.
- Ensure that all the hardware, network, and resource requirements are met. See "Application Manager Recommendations and Requirements," on page 19.

Procedure

1 Create the Domain Name System (DNS) record for the Application Manager virtual appliance host.

CAUTION As part of creating the DNS record, create a pointer (PTR) resource record in a reverse lookup zone. This allows reverse resolving of IP addresses, which is a required configuration for Application Manager to function properly.

The DNS name must be available in your DNS server for the Application Manager hostname to be recognized. Depending on your organization, creating the DNS record might take several days. Provide enough time to ensure that the DNS name is available when required.

The hostname has at least three parts, a.b.c. For example, Org1.MyDomain.com.

IMPORTANT When you are prompted for a hostname in the Application Manager virtual appliance, be aware that the name you enter, such as Temp.MyDomain.com, is also used for initial access to the Operator Web interface. For example: http://Temp.MyDomain.com. The first part of the hostname, "Temp" in this example, is later replaced with the first organization you create in the Operator Web interface. If you name the first organization Org1, http://Org1.MyDomain.com can be used to reach Application Manger in the future. The URL http://Temp.MyDomain.com continues to provide access to Application Manager, too. To avoid having two URLs that access the same interface, the best practice is to enter a DNS name where the first part of the name, such as Org1, matches the first organization name that you plan to create. This practice allows one URL, http://Org1.MyDomain.com, to continuously provide access to Application Manager.

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2 Create a DNS address record, or DNS address records, for each additional organization you plan to create for Application Manager, pointing to the same IP address.

3 Download the .ova file for the Application Manager virutal appliance from the VMware Download Center and deploy it.

You can download the `.ova` file directly to the vSphere host or you can download it to another machine.

Convert the Virtual Appliance File Format

You can convert the virtual appliance file format from the OVA format to the VMX format by using the VMware OVF tool. Perform this file format conversion only if the hypervisor does not support the OVA format.

The Open Virtualization Format (OVF) tool is a free command-line utility that can convert file formats of virtual machines. You install the virtual appliance on a VMware hypervisor that supports the VMX format and convert the OVA format to the VMX format.

Procedure

1 Download the VMware OVF tool from the VMware Web site and install it.

Follow the installer instructions to install the tool.

2 Create and name a directory in your hypervisor's data store, which is the directory where virtual machines reside.

Provide the name for the directory.

3 Move to that directory.

The converter tool deposits output files in the current directory.

4 Start the converter tool with the following command: *`path-to-ovftool`* `-tt=VMX` *`ova-file-name VMX-file-name`*

For example: `/usr/bin/ovftool -tt=VMX virtualappliance-1.1.0.ova virtualappliance`

The command might take a few minutes to complete. The following is sample output:

```
Opening OVA source:
../virtualappliance-1.1.0.ova
Opening VMX target: central-virtualappliance
Target: central-virtualappliance.vmx
```

```
Disk progress: 36%
…
Disk Transfer Completed
Completed successfully
```

Example: File Conversion Output

Two items appear in your current directory as a result of this task: a `.vmdk` disk image file and a `.VMX` virtual machine configuration file, as the following example shows:

```
-rw------- 1 root root 1.6G 2011-05-17 14:46 central-virtualappliance-disk1.vmdk
-rw-r--r-- 1 root root 1.1K 2011-05-17 14:46 central-virtualappliance.vmx
```

What to do next

Install the virtual appliance on your hypervisor.

Installing Application Manager 5

After you install Application Manager virtual appliance, you can access the Application Manager Operator Web interface to run the Operator setup wizard.

Installing Application Manager includes the following tasks:

- Use vSphere Client to install the Application Manager virtual appliance.
- Start and configure the virtual appliance.
- Use the Application Manager Web interface to perform the initial configuration of Application Manager necessary to log in to Application Manager as an operator.

The steps to prepare the virtual appliance can vary. For specific instructions, see the vSphere documentation.

This chapter includes the following topics:

Start the Application Manager Virtual Appliance

Starting the Application Manager virtual appliance gives you access to the Application Manager virtual appliance interface, including the CLI of the underlying SLES operating system.

You perform the preliminary configuration of Application Manager with the virtual appliance interface. The underlying operating system for Application Manager is SUSE Linux Enterprise Server (SLES) 11 SP1. You can configure the operating system files directly from the Application Manager virtual appliance interface. Use caution when editing the operating system files since changes can have unanticipated affects on the deployment.

Procedure

1 Use vSphere Client to install the Application Manager virtual appliance by choosing the Deploy OVF Template option.

   See VMware vSphere documentation.

2 Power on the virtual appliance.

   This action boots the virtual appliance's SLES operating system, starts the Application Manager processes, and connects to a DHCP server, if present, to acquire an IP address.

During start up, the virtual machine displays messages in the Application Manager virtual appliance interface. You can usually ignore the messages until you are prompted to change the UNIX password. You can perform the initial configuration of the Application Manager as described in "Use the Virtual Appliance Interface for the Initial Application Manager Configuration," on page 28.

Use the Virtual Appliance Interface for the Initial Application Manager Configuration

Use the Application Manager virtual appliance interface to make the initial configurations to Application Manager, such as network and time-related configurations.

When you install the Application Manager virtual appliance, the Application Manager virtual appliance interface first prompts you for the root and sshuser passwords. After you provide and confirm the passwords, the interface presents you with a wizard that leads you through the basic configuration. You can return to the Application Manager virtual appliance interface at any time to update these settings or to perform other configurations to the SLES operating system.

Prerequisites

- Configure the Application Manager virtual appliance interface after you have installed the virtual appliance on vSphere. See "Start the Application Manager Virtual Appliance," on page 27.
- Verify that you followed the steps to prepare for the installation of the Application Manager. See "Prepare to Install Application Manager," on page 23.
- If applicable, open a firewall port for an external Network Time Protocol (NTP) server. For more information about the network requirements for configuring an NTP server, see "Application Manager Recommendations and Requirements," on page 19.

Procedure

1 At the root UNIX password prompts, provide and confirm the root user password for access to the SLES operating system of the Application Manager.

2 At the sshuser UNIX password prompts, provide and confirm the password for remote access to the SLES operating system of Application Manager.

Application Manager creates the user sshuser for you. This user can access Application Manager virtual appliance command line remotely using the `ssh` Linux command, or SSH client. This user has limited privileges to the command line. Therefore, once you connect remotely, you might want to use the `su` command to switch users from sshuser to root.

IMPORTANT SSH (Secure Shell) client is a program for remote access. By default `ssh` access is limited to machines on the same subnet. Changing the scope of access involves `sshd`, the ssh daemon, and might require you to edit the `hosts.allow` and `hosts.deny` files. See Linux man pages for more information.

The wizard of the Application Manager virtual appliance interface starts.

3 Respond to the wizard prompts with information specific to your deployment.

Option	Action
Respond to the IPv6 prompt.	Type **y** if you have an IPv6 network. If you do not have an IPv6 network, accept the default response of **n**.
Respond to the DHCPv4 prompt.	NOTE The recommended practice is to use a static IP address. If you have a static IP address, type **n**. Continue responding to the subprompts related to a static IP address. If you have a DHCPv4 address, accept the default response **y** and continue responding to the subprompts related to DHCP and a proxy server. If you respond with **n**, continue responding to the subprompts related to a static IP address, including subprompts about IPv4 address, netmask, gateway, DNS servers, and proxy server.
Respond to the hostname prompt.	Type a unique hostname with at least three parts, a.b.c. IMPORTANT Be aware that the name you enter, such as Temp.MyDomain.com, is also used for initial access to the Operator Web interface. For example: http://Temp.MyDomain.com. The first part of the hostname, "Temp" in this example, is later replaced with the first organization you create in the Operator Web interface. If you name the first organization Org1, http://Org1.MyDomain.com can be used to reach Application Manger in the future. The URL http://Temp.MyDomain.com continues to provide access to Application Manager, too. To avoid having two URLs that access the same interface, the best practice is to enter a hostname where the first part of the name, such as Org1, matches the first organization name that you plan to create. This practice allows one URL, http://Org1.MyDomain.com, to continuously provide access to Application Manager.

When you are finished configuring the network settings, the main screen of the Application Manager virtual appliance interface appears.

4 If necessary, configure a Network Time Protocol server.

By default, the Application Manager Appliance points to specific external NTP servers, as listed in the `/etc/ntp.conf` file. However, networking or DNS issues might prevent the virtual appliance from reaching the external NTP servers. Also, you might want to use NTP servers other than the default settings. When you properly configure the Application Manager deployment, the time for all systems is maintained within a range of one minute.

CAUTION Failure to follow the NTP recommendations can prevent user access to the Application Manager Web interface since both the SAML and Kerberos protocols rely on an accurate system clock. The protocols used between Application Manager and the Connector and between the Connector and Active Directory require that the time synchronization of these systems falls within a narrow range.

a Select **Login** and log in to the Linux operating system with root credentials.

b Using Linux commands configure Application Manager's time settings.

See Timekeeping best practices for Linux guests (KB 1006427) for information about time settings for SLES 11. Consult the section on NTP recommendations.

c Exit the command line to return to the main page of the Application Manager virtual appliance interface.

5 Confirm the Network Time Protocol configuration.

You should check this screen in the following situations:

- When you first install the Application Manager Appliance.
- Any time in the future when you modify the networking environment that can affect the ability to contact the NTP server or when you change the NTP configuration.

- As a troubleshooting option when users experience an access issue.

See the troubleshooting section for information about the possible messages on this screen.

6 Set the time zone for Application Manager.

a Select **Set Timezone**.

b Continue selecting location options to select your specific time zone.

7 In the Application Manager virtual appliance interface, select **Configure** to view or set available configuration options.

You should initially configure the Application Manager virtual appliance for testing or trial purposes. Therefore, you can leave several options unconfigured and return to the Application Manager virtual appliance later for further configuration. The following list describes options you can skip during the initial configuration.

Option	Description
Generate New SSL Certificate	By default, SSL is not enabled and no SSL certificate is needed. You do not need to enable SSL for trials or testing. However, for security reasons, you should enable SSL before you move the deployment to production. If you configure your Web server to be secure, you need a certificate to certify your organization's Application Manager Website to end users. You can use either a third-party CA certificate or you can generate your own self-signed SSL certificate. If you use a self-signed SSL certificate, you must deploy it to user machines for ThinApp integration.
Configure Web Server	Insecure. By default, the Web server uses insecure ports, which is appropriate for initial trials or testing. Also, using insecure ports allows you to test ThinApp integration without installing certificates on user machines. Secure. Use secure ports for pre-production testing or production. To use secure ports, you need either a third-party CA certificate or an SSL certificate to certify your organization's Application Manager Website to end users.
Configure Database Connection	By default, Application Manager uses an internal database that runs directly in the Application Manager virtual appliance. To support high availability and load balancing, you must disable the internal database and configure a connection to a supported external database.
Database Key Management	Database key management applies when you point multiple Application Manager instances to a shared external database.
Gather Diagnostic Information for Support	Gathering diagnostic information applies to a troubleshooting procedure that involves gathering log and other data for technical support purposes.

8 Record the Application Manager hostname or IP address as listed on the Change Application Manager Configuration page.

When you finish the initial configuration of the Application Manager virtual appliance, you can enter the hostname in a browser to gain initial access to the Application Manager Operator Web interface. The Operator setup wizard leads you through the creation of the first Application Manager organization.

Option	Description
Configure Hostname	The three-part hostname is listed.
Configure Network	The IP address is listed.

9 Restart the Apache Tomcat server for the time zone configuration to take effect.

a In the Application Manager virtual appliance interface, select **Configure**.

b Type the number to **Manage Web Server**.

c Type the number to **Restart Tomcat**.

Application Manager is ready for further configuration.

What to do next

Use a browser to access the Operator Web interface.

Configuring Application Manager with the Operator Setup Wizard

6

Use the Operator setup wizard for the initial configuration of Application Manager, including the creation of the first organization. You can then configure the Connector or return to the Operator Web interface for further configuration.

The setup wizard leads you through a quick and simple configuration process.

Access the Application Manager Operator Web Interface

When Application Manager has a hostname and IP address, you can use a browser to access the Operator Web interface. The first time you access the Operator Web Interface, the Operator setup wizard leads you through the initial configuration, including the creation of the first Application Manager organization.

Running the Operator setup wizard creates your deployment's initial Application Manager organization.

NOTE In the Operator setup wizard, you are required to provide a name for your organization. That name becomes part of the URL used to access your initial organization. See "Prepare to Install Application Manager," on page 23 for the best practice for creating a DNS record for the virtual appliance host. That best practice relates to the name you choose for your organization.

Prerequisites

Verify that the following conditions are met:

- The VMware Application Manager license key is available.
- You have configured the Application Manager virtual appliance and have the hostname or IP address of the Application Manager recorded and available. See "Use the Virtual Appliance Interface for the Initial Application Manager Configuration," on page 28.
- You have access to a supported browser. See the Application Manager release notes for the updated list.

Procedure

1 Use a supported browser to access the Application Manager Operator Web interface.

Point the browser to the three-part hostname of the Application Manager.

http://*SubDomain.MyDomain*.com

CAUTION Use the Application Manager hostname, not the IP address, to access the Connector Web interface.

The Operator Web interface appears, prompting you to begin the Operator setup wizard.

2 Run the Operator setup wizard to create your initial organization.

During the setup, you must decide to generate an activation token or to create a temporary administrator.

Important Whichever option you choose, to generate a Connector activation token or to create a temporary administrator, be aware that to reach Application Manager with a browser before you configure the Connector, you must use a specific URL, such as: http://*MyOrg*.*MyDomain*.com/SAAS/login/0. Replace the place holders *MyOrg* and *MyDomain* with the appropriate information. After you have configured the Connector, you as an administrator, and users can access Application Manager with the short URL, http://*MyOrg*.*MyDomain*.com/.

- Generate a Connector activation token. This is the default action. Use this option if you want to configure the Connector next. After you have configured the Connector, you can configure the Application Manager Administrator Web interface. When you select this option, you are provided the short organization URL and activation code. Copy and save that information. You need the activation code to configure the Connector. The short organization URL is applicable after you complete your Application Manager deployment.
- Create a temporary administrator. Select this option if you want access to the Application Manager Administrator Web interface prior to configuring the Connector. In this situation, when you are ready to configure the Connector, you must generate the activation code by logging in to Application Manager as a temporary administrator and adding an identity provider. When you select this option, an email message is sent to you with a specific link to Application Manager, and with a temporary administrator username and password. To access Application Manager as a temporary administrator, use the information in the email message. You can use the link provided or use the following long URL: http://*MyOrg*.*MyDomain*.com/SAAS/login/0.

After you complete the setup wizard, you are provided a link to the Operator dashboard.

3 If you want to view or configure the Operator Web interface before proceeding with any other task, follow the link to the Operator dashboard.

Important From this point forward, to access the Operator Web interface directly with a URL, use the following URL: http://*MyOrg*.*MyDomain*.com/SAAS/login/0.

What to do next

In most cases, the best practice after completing the Operator setup wizard is to first configure the Connector and then configure the Application Manager Administrator Web interface as an administrator.

Making Additional Application Manager Configurations

7

Key Application Manager functionality can be configured with the Application Manager virtual appliance interface or with a combination of interfaces.

When you install Application Manager, the virtual appliance leads you through a configuration wizard. After you perform that initial configuration, you can use the virtual appliance interface and other interfaces for further configuration. Perform the configuration tasks that apply to your deployment.

This chapter includes the following topics:

Configure Application Manager for Logging

You can configure logs in the Application Manager virtual appliance interface. You configure Web server logging behavior in the `/usr/local/horizon/conf/log4j.properties` file. To store logging information externally, you can configure an external syslog server.

By default, Application Manager logs Web-server related information as follows:

- Web server log file: `/opt/vmware/horizon/horizoninstance/logs/horizon.log`.

You can edit the log configuration files to control where the Connector stores the log information.

Table 7-1. Application Manager Logging Configuration

Log Configuration File	Filepath	Information
`log4j.properties`	`/usr/local/horizon/conf/log4j.properties`	Web server logs rotate with a default size of 50MB as configured in the `log4j.properties` file. By default, these logs are stored in `/opt/vmware/horizon/horizoninstance/logs/horizon.log`. For more details about the Web server logging behavior, see the `log4j.properties` file. The Web server logging behavior is preconfigured and might not require any further configuration.
`syslog`	`/etc/syslog-ng/syslog-ng.conf`	Configure the `syslog-ng` file to direct program logs to your external syslog server.

The best practice is to store program logs in an external syslog server.

For more information about editing `log4j` files, see Apache documentation on Apache Logging Services.

Prerequisites

Verify that a syslog server is installed, configured, and accessible from Application Manager.

Procedure

1 Access the Application Manager virtual appliance interface.

2 Select **Login** and log in to the SLES operating system.

3 Use the appropriate commands to access and configure the `log4j.properties` file to send logs to syslog internally.

4 Use the appropriate commands to access and configure the `syslog-ng.conf` file to send logs to an external syslog server.

5 Restart the Apache Tomcat server for the changes to the `log4j.properties` file to take effect.

   a In the Application Manager virtual appliance interface, select **Configure**.

   b Type the number to **Manage Web Server**.

   c Type the number to **Restart Tomcat**.

After you configure the log configuration files, the new logging behavior takes effect.

Configuring SSL Connectivity to Application Manager

SSL connectivity to Application Manager and the Connector is disabled by default to simplify the configuration of your Application Manager deployment during the proof-of-concept phase. Whether you configure a self-signed certificate or a third-party CA certificate, you can implement the necessary tasks in phases.

Verify that the state of SSL, enabled or disabled, always matches between the Connector and Application Manager. You can wait to enable SSL until you move Application Manager into production.

NOTE You do not need an SSL certificate if the Configure Web Server option of Application Manager and the Connector are set to insecure mode. In secure mode, you can use either a self-signed or a third-party SSL certificate. Typically, self-signed SSL certificates are used during pre-production testing, but you can use a third-party SSL certificate during testing if you want. During production, the best practice is to use a third-party CA SSL certificate.

For detailed information of the SSL-related tasks to perform during the recommended deployment phases, see "Trial, Test, and Production Deployment Phases," on page 7. The following bulleted items provide an overview of tasks you should perform, if applicable, after you enable SSL for your Application Manager deployment:

- Update each SAML application that you previously configured without SSL to now use SSL. In other words, ensure that each SAML application now reaches Application Manager using HTTPS instead of HTTP. This might involve working with account administrators for specific SAML applications. See *Application Manager Administration Help* for information about configuring SAML applications.
- If you are providing users with access to Windows Applications captured as ThinApp packages, reinstall Horizon Agent on each user's system to update the Application Manager URL from HTTP to HTTPS. See Deploy Horizon Agent.

Procedure

1 Enable Secure Ports for the Application Manager on page 37

To enable SSL for your Application Manager deployment, first enable secure ports for Application Manager.

2 Enable Secure Ports for the Connector on page 37

To enable SSL for your Application Manager deployment, after you enable secure ports for Application Manager, you must enable secure ports for the Connector. For the Connector, enabling secure ports requires you to reset and reconfigure the Connector, which requires a new activation code.

3 Generate an SSL Certificate on page 38

If you decide to use a self-signed SSL certificate instead of a third-party CA certificate, you need to generate and distribute the certificate.

4 Copy the Self-Signed Application Manager SSL Certificate to Each Connector Instance on page 39

If you have generated a self-signed Application Manager SSL certificate, you must copy the certificate to each Connector instance associated with that Application Manager instance.

5 Configure a Third-Party CA Certificate for Application Manager on page 40

The best practice is to configure a third-party CA certificate after you have configured a self-generated certificate.

Enable Secure Ports for the Application Manager

To enable SSL for your Application Manager deployment, first enable secure ports for Application Manager.

Enabling secure ports for the Application Manager is the first task in series of tasks required to enable SSL.

Procedure

1 Access the Application Manager virtual appliance interface.

2 Select **Configure**.

3 At the prompt, type the number to **Configure Web Server**.

4 At the prompt, type the number to **ports 443 and 8443**.

This enables secure ports 443 and 8443.

5 At the prompt, type the number to **ports 80 and 8080**.

This disables insecure ports 80 and 8080.

6 Exit the Application Manager virtual appliance interface.

What to do next

Enable secure ports for the Connector.

Enable Secure Ports for the Connector

To enable SSL for your Application Manager deployment, after you enable secure ports for Application Manager, you must enable secure ports for the Connector. For the Connector, enabling secure ports requires you to reset and reconfigure the Connector, which requires a new activation code.

For the Connector, secure ports are always enabled and cannot be disabled. Insecure port 80 is enabled by default and can be disabled. This task involves disabling insecure port 80 and resetting the Connector configuration.

Prerequisites

Enable secure ports for Application Manager.

Procedure

1 Access the Connector virtual appliance interface.

2 Select **Configure**.

3 At the prompt, type the number to **Configure Web Server**.

4 At the prompt, type the number to **port 80**.

This disables insecure port 80.

5 Exit the Connector virtual appliance interface.

6 Log into Application Manager as either an operator or administrator to create a new activation code for the Connector.

◆ **Table 7-2.** Methods for Creating a New Connector Activation Code

Application Manager Operator Web Interface	Application Manager Administrator Web Interface
You can use the Operator Web interface to create an activation code for a new Connector instance. 1 Navigate to the **Organizations** tab. 2 Click an organization name. 3 Click **Manage Organization Connectors**. 4 Select **Generate New Connector,** then click **Save**. An activation code appears. The code is available until the Connector is activated.	You can also use the Administrator Web interface to create an activation code for a new Connector instance. 1 Navigate to the **Settings** tab. 2 Click **Identity Provider Add Identity Provider**. 3 Enter a name and description, then click **Save**. An activation code appears. The code will be available until the Connector is activated.

7 Leave Application Manager open so that you can copy the activation code into the Connector Web interface.

8 Access the Connector Web interface.

9 Navigate to the Configuration page of the Advanced tab.

10 Click **Reset** to reset the Connector configuration.

11 When prompted, paste the activation code, select **Use SSL** option, then click **Next**.

12 Continue to configure the Connector.

The Connector is reconfigured with secure ports enabled.

What to do next

Configure SSL by performing either of the following:

Generate an SSL Certificate

If you decide to use a self-signed SSL certificate instead of a third-party CA certificate, you need to generate and distribute the certificate.

Prerequisites

- Enable secure ports for the Application Manager.
- Enable secure ports for the Connector.

Procedure

1 Access the Application Manager virtual appliance interface.

2 Select **Configure**.

3 At the prompt, type the number to **Generate New SSL Certificate**.

4 Enter a domain name with at least two parts.

The name should match part of the host name.

5 Copy the certificate to each Connector instance.

6 Deploy the certificate to each user machine.

For production rollout, multiple tools are available to deploy SSL certificates to user machines. For testing with a limited number of users, users can install the SSL certificate themselves from an accessible location.

Copy the Self-Signed Application Manager SSL Certificate to Each Connector Instance

If you have generated a self-signed Application Manager SSL certificate, you must copy the certificate to each Connector instance associated with that Application Manager instance.

Prerequisites

- Enable secure ports for Application Manager.
- Enable secure ports for the Connector.
- Generate a self-signed Application Manager SSL certificate.

Procedure

1 Access the Application Manager virtual appliance interface.

2 Select **Login** and log in to the Linux operating system with the appropriate credentials.

3 Enter the following Keytool command to access the certificate:`keytool –list –keystore /opt/vmware/horizon/horizoninstance/conf/tcserver.keystore –rfc –storepass changeme`

4 Copy the text from BEGIN CERTIFICATE to END CERTIFICATE and save it to a file location such as `/tmp/cert.pem`.

5 Use your method of choice to copy the file from the Application Manager virtual appliance to the Connector virtual appliance, such as to the following location: `/tmp/cert.pem`.

Many methods are available for copying and moving files between systems, such as using the `ssh` command.

6 In the Connector virtual appliance interface, issue commands to move the certificate to the common SUSE certificate store while creating a symbolic link to the certificate file, such as the following:

```
cp /tmp/cert.pem /etc/ssl/certs/
c_rehash
```

7 In the Connector virtual appliance interface, enter the command below to import the certificate into the Java keystore:

```
keytool –importcert –file /tmp/cert.pem –keystore /usr/java/jre–vmware/lib/security/cacerts –storepass changeit
```

8 When asked if you trust this certificate, enter **yes**.

9 Restart the Connector Web server using the following command:

```
/etc/init.d/tcserver–c2 restart
```

NOTE If the command to import the certificate into the Java keystore fails with the following error:

```
:~ # keytool –importcert –file /tmp/cert.pem –keystore
/usr/java/jre–vmware/lib/security/cacerts –storepass changeit
keytool error: java.lang.Exception: Certificate not imported, alias <mykey> already exists
```

Delete the certificate with the alias `mykey` using the following command `:~ # keytool –delete –alias mykey –keystore /usr/java/jre–vmware/lib/security/cacerts –storepass changeit` . Then run the import command used in step 6 again.

The self-signed Application Manager certificate has been copied to the Connector, allowing Application Manager and Connector to communicate using SSL.

What to do next

Use the Application Manager deployment to verify that SSL is functioning between Application Manager and the Connector. If an SSL problem exists, when you use the Connector Web interface and provide the activation code, the Connector displays an error message indicating that the Connector cannot connect to a specified URL. See the troubleshooting section of *Installing and Configuring the Connector*.

Configure a Third-Party CA Certificate for Application Manager

The best practice is to configure a third-party CA certificate after you have configured a self-generated certificate.

To obtain a signed third-party CA certificate, follow the Apache Tomcat SSL Configuration instructions with the following exceptions: instead of editing the `server.xml` file and creating a keystore, use the Configure Web Server option in the Application Manager virtual appliance interface to enable the secure option and to generate an SSL certificate. The generated certificate is automatically placed in the existing keystore, so later you can simply replace it with your signed third-party certificate. See detailed instructions below.

Prerequisites

During the proof-of-concept phase or test phase, generate an Application Manager SSL certificate. For more information about the recommended phases of deployment, see "Trial, Test, and Production Deployment Phases," on page 7.

Procedure

1 If you have not yet generated a self-signed certificate, use the Application Manager virtual appliance interface now to generate an SSL certificate.

2 Follow the Apache Tomcat SSL Configuration instructions to create a certificate signing request (CSR).

3 Send the certificate request to the certificate authority (CA) for signing.

IMPORTANT If you determine that a wildcard certificate suits your enterprise's requirements, communicate to the CA that you require a wildcard certificate in the format CN=*.*MyDomain.com*. For example, if your hostname is Org1.mydomain.com, request a certificate with CN=*.mydomain.com. If you use a wildcard certificate, you can also use it as the SSL certificate for the Connector.

4 Use keytool to delete the certificate you generated so that you can replace it with the signed third-party certificate.

5 Follow the Apache Tomcat SSL Configuration instructions to import the signed third-party certificate to the keystore. Use the following keystore information.

Keystore Location	/opt/vmware/horizon/horizoninstance/conf/tcserver.keystore
Keystore Alias	tcserver
Keystore Password	changeme

6 Use the Application Manager virtual appliance to restart the Apache Tomcat server.

   a In the Application Manager virtual appliance interface, select **Configure**.

   b Type the number to **Manage Web Server**.

   c Type the number to **Restart Tomcat**.

What to do next

Use the Application Manager deployment to verify that SSL is functioning between Application Manager and the Connector. If an SSL problem exists, when you use the Connector Web interface and provide the activation code, the Connector displays an error message indicating that the Connector cannot connect to a specified URL.

Configuring Clustering for Application Manager

To configure Application Manager instances in a cluster, you must connect each Application Manager instance to a shared external database server.

By default, Application Manager uses its internal database server. You can use the internal database server if you deploy a single Application Manager instance. However, if you use multiple Application Manager instances you must use an external database server and point each Application Manager instance to that external database server.

Application Manager employs encryption to secure the Application Manager data. The Application Manager instances in your deployment must all have a copy of the same master key. When you first configure an Application Manager instance, a new master key is generated automatically and stored in the master keystore of that Application Manager instance. You can then add additional Application Manager instances to the cluster. However, in order to access the encrypted data of the shared database server, each Application Manager instance in the cluster must have a copy of the same master key.

To ensure that each Application Manager instance has a copy of the same master key, you can perform one of two procedures.

Table 7-3. Methods for Copying a Master Key Among Application Manager Instances

Clone an Existing Application Manager Instance	Configure a New Application Manager Instance and Fetch an Existing Master Keystore
This method is simpler and less prone to error. After you have configured an Application Manager instance, you use the Application Manager virtual appliance Interface to configure a connection to an external database server, which disables the internal database and creates a master key. To create additional Application Manager instances, you can clone a previously configured Application Manager virtual appliance. The cloned Application Manager instance matches the original. Therefore, it is configured with a copy of the master key and it is connected to the external database. **IMPORTANT** After you clone a virtual machine, you must assign the cloned virtual machine a new IP address and hostname. Other actions might be required. Search http://kb.vmware.com/kb/ for related VMware Knowledge Base articles.	If you do not clone a previously configured Application Manager virtual appliance, you must install and configure a new Application Manager instance to point to the same external database server as the first Application Manager instance. Then you must fetch the master keystore from a previously created Application Manager instance. This action copies the master key to the current Application Manager instance, allowing that instance to read the encrypted data in the external database. For each Application Manager instance you add to the cluster, you must fetch the master keystore from a previous instance.

Configure an External Database Connection

To configure clustering for Application Manager, for each Application Manager instance, you must connect the Application Manager instance to an external database server. You can then add additional Application Manager instances to the deployment.

The action of configuring a connection from an Application Manager instance to an external database server automatically disables the internal database server. You must configure an external database connection for the first Application Manager instance that you connect to the external database server.

NOTE If you make a clone of a previously configured Application Manager instance, the cloned Application Manager instance automatically connects to the external database server. You do not need to configure an external database connection for the additional instance.

If you choose to configure an additional Application Manager instance instead of cloning it, you must configure the additional instance and fetch the master keystore from a previously configured Application Manager instance.

Prerequisites

Have a plan for your Application Manager deployment that includes how you will handle load balancing and high availability. Before you connect the Application Manager instances to an external database server, perform the following:

- Install and configure PostgresSQL 9.1 as the external database server, with the citext module installed.

  The citext module supports the CITEXT data type, a case insensitive text type.
- Install and configure the load balancing implementation.
- Install and configure all the instances of Application Manager that you plan to use.
- Consider the Connector in your deployment. You can use multiple Connector instances as well as multiple Application Manager instances and should consider how you will use load balancing throughout the Application Manager deployment.

Procedure

1 Access the Application Manager virtual appliance interface.

2 Select **Configure** and press Enter.

3 At the prompt, type the number to **Database Key Management** and press Enter.

4 At the prompt, type the number to **Configure Database Connection** option and press Enter.

5 Respond to the prompts about the database connection and press Enter after each response.

   a Enter **y** to indicate that you want to connect to the external database server.

   b Enter the IP address or the FQDN of the database server.

   c Enter the name of the user with read and write privileges to the database.

   d Enter the password of the user you just entered, the user with read and write privileges to the database.

6 Enter **q** when prompted to return to the Database Connection Configuration page.

   If this Application Manager instance is the first in the cluster, the master key is generated automatically. You do not need to fetch a master key store. You can exit the Database Connection Configuration page. However, if this Application Manager instance is being added to a cluster where one or more Application Manager instances already exist, continue to the next step.

7 If you plan to fetch a master keystore from a previously created Application Manager instance in the cluster, on the system from which you will fetch the master keystore, enable root access to the `ssh` tool.

   a On the Application Manager instance from which you will fetch the master keystore, log in to the operating system and open the file `/etc/ssh/sshd_config` for editing.

   b Locate the following line `PermitRootLogin no` and change it to `PermitRootLogin yes`,

   c Restart the `ssh` tool with the following command `/etc/rc.d/sshd restart`.

8 Return to the Application Manager instance to which you want to copy the fetched master keystore and complete the fetching procedure.

   a Access the Change Application Manager Configuration screen, and if necessary, access the next page of options, at the prompt, type the number to **Database Key Management**, and press Enter.

   b At the prompt, type the number to **Fetch Master Keystore** and press Enter.

c At the respective prompts, provide the IP address, root username, and root password of the Application Manager instance from which the master keystore is to be copied.

d Exit the Database Connection Configuration page.

What to do next

Log in to Application Manager as an operator to manage Application Manager clusters. Also, you can generate a new master key for an Application Manager cluster at any time. See "Configure an External Database Connection," on page 41

Generate a New Master Key for an Application Manager Cluster

You can generate a new master key from any Application Manager instance in a cluster. However, you must update every Application Manager instance in the cluster with the new key.

To further protect the encrypted data in the external database, you might want to periodically generate a new master key for your Application Manager cluster. When you generate a master key in an Application Manager instance, you must then copy the newly generated key to each of the remaining Application Manager instances that use the same database. You copy the key by accessing an Application Manager instance and fetching the master keystore from the Application Manager instance you used to generate the new key.

CAUTION After you generate a new master key, the other Application Manager instances that use the same database stop functioning until you copy over the newly generated master key.

Prerequisites

Create an Application Manager cluster.

Procedure

1 Access the Application Manager virtual appliance interface of one of the Application Manager instances in your Application Manager cluster.

2 Select **Configure** and press Enter.

3 If necessary, access the next page of options, at the prompt, type the number to **Database Key Management**, and press Enter.

4 At the prompt, type the number to **Generate New Master Key** and press Enter.

5 At the prompt, type **y** to proceed with the key generation.

The new key is generated.

6 For each remaining Application Manager instance that uses the same database, fetch the master keystore from the Application Manager instance you just used to generate the new key.

a Access the Application Manager virtual appliance interface of an Application Manager instance that you have not yet updated with the newly generated master key.

b Select **Configure** and press Enter.

c Return to the Database Connection Configuration page.

d At the prompt, type the number for the Fetch Master Keystore option and press Enter.

e At the respective prompts, provide the IP address, username, and password of the Application Manager instance from which the master keystore is to be copied.

Once you have updated the master key of each Application Manager instance that shares the same database, all the instances can access the shared database.

Update Application Manager

You can check for updates in the Operator Web interface or the Application Manager virtual appliance interface. However, in most cases, using the Operator Web interface is more convenient. To install the update, you must use the virtual appliance interface.

Prerequisites

- Verify that Application Manager is installed and properly configured.
- Take a snapshot of the Application Manager virtual appliance as a backup.
- If you are using an external database, back up the database.
- Ensure that Application Manager can resolve and reach vapp-updates.vmware.com on port 80 over HTTP.

Procedure

1 Check for updates of Application Manager

◆ **Table 7-4.** Methods of Checking for Application Manager Updates

Application Manager Operator Web Interface	Application Manager Virtual Appliance Interface
Using the Operator Web interface, you have two ways to check for updates. ■ When updates are available, a message automatically appears in the Dashboard tab. ■ Manually check for updates. a Click the **Settings** tab. b Click the **System Information** link. c Click the **Check for Updates** link. A message appears informing you if an update is available.	You can also use the Application Manager virtual appliance interface to check for updates. If an update is available, you can install the update directly from the Application Manager virtual Appliance interface. 1 In the Application Manager virtual appliance interface, select **Configure**. 2 If necessary, access the next page of options and, at the prompt, type the number to **Update Application Manager**. 3 At the prompt, type the number to **Check for Updates**. If an update is available, an option appears on the page allowing you to download the update.

2 If an update is available, download the update.

If you used the Application Manager virtual appliance interface to check for updates, you have already performed the initial substeps required for this step.

a In the Application Manager virtual appliance interface, select **Configure** and press Enter.

b If necessary, access the next page of options, at the prompt, type the number to **Update Application Manager**, and press Enter.

A new screen appears that provides information about the end user license agreement (EULA).

c Access and read the EULA.

d At the prompt, type the number to **Download and Install the Update** and press Enter.

e At the prompt, type **y** to accept the EULA and proceed with the update.

The update completes.

f Press Enter, then type **q** to exit the update screen.

Your version of Application Manager is updated. From the Application Manager Web interfaces, the build number of the updated Application Manager version appears at the bottom of pages.

What to do next

Log in to the Application Manager Operator Web interface to verify that the build number located at the bottom of each page has increased to the appropriate build.

8 Troubleshooting Application Manager

You can troubleshoot some problems with Application Manager directly from the Application Manager Web interface, while some troubleshooting involves other aspects of your Application Manager deployment.

This chapter includes the following topics:

Potential Network Time Protocol Issue

As a troubleshooting or preventative procedure, you can check the Application Manager Network Time Protocol (NTP) configuration.

Problem

The protocols used between Application Manager and the Connector and between the Connector and Active Directory require that the time synchronization of these systems falls within a narrow range. The time settings of these systems might not be synchronized or the time settings might drift out of synchronization. When you installed the Application Manager appliance, you either used the default NTP configuration, or you reconfigured NTP. See "Use the Virtual Appliance Interface for the Initial Application Manager Configuration," on page 28 for steps specific to NTP configuration. Also, see the following VMware Knowledge Base article on the topic: Timekeeping best practices for Linux guests (KB 1006427).

You can follow the Solution section in the following situations to prevent an NTP-related problem from occurring:

- When you first install the Application Manager Appliance.
- When you modify the networking environment that can affect the ability of Application Manager to contact the NTP server.
- When you change the NTP configuration

You can also follow the Solution section to troubleshoot, for example when users cannot access Application Manager.

Cause

The time setting of the Application Manager virtual appliance is not properly synchronized with an NTP server.

Solution

1 In the Application Manager virtual appliance interface, select **Configure**.

2 If necessary, access the next page of options, at the prompt, type the number to **NTP Status**, and press Enter.

A new screen appears that provides information about the NTP configuration. The NTP status is listed at the top of the page.

Types of Status Messages	Explanation
Time Server Connection Error	If the status indicates that there is a time server connection error, the NTP configuration is incorrect or the Application Manager instance is not able to reach an NTP server. You must troubleshoot your configuration to find the cause.
Not Synchronized	The status message is in red text and indicates that the Application Manager virtual appliance time has drifted by a minute (60,000 milliseconds) or more, or has not polled an NTP server in 30 minutes or more. The NTP configuration is incorrect. Example Causes: ■ A firewall is preventing the Application Manager instance from reaching an NTP server. ■ The DNS cannot resolve the NTP server. You must troubleshoot your configuration to find the cause.
Synchronized	The status message is in green text and indicates that the Application Manager virtual appliance has not drifted outside the 60,000 ms range and no more than 30 minutes has passed since the NTP server was last polled. Example: ■ 3ms clock drift, last poll 176 seconds ago. Such a status message verifies that polling of the NTP server and the resetting of clock drift is taking place.
Waiting to Stabilize	The status message is in red text and indicates that the NTP status has not stabilized yet. This should be a temporary state. If the message persists, you must troubleshoot your configuration to find the cause.

3 If a recent change is not reflected on the NTP Status page, type the option to **Restart NTP** and press Return.

NTP configurations can occur slowly. Therefore, you might want to implement this step to force the synchronization.

4 If you determine that the time setting of the Application Manager virtual appliance is not properly synchronized with an NTP server, check the current NTP configuration of the appliance to verify that the configuration conforms to the guidelines in the referenced KB article.

Missing the Application Manager Operator Web Interface Password

If you no longer have the Application Manager Operator Web interface password, you can use the Linux command line of the Application Manager virtual appliance to change the password.

Problem

You cannot access the Application Manager Web interface.

Cause

You do not have the Application Manager Web interface password. For example, you have forgotten or misplaced the password.

Solution

1 Access the Application Manager virtual appliance interface.

2 Select **Login** and log in to the Linux operating system with root credentials.

3 Run the following command: `hznAdminTool setOperatorPassword –pass` *newpassword*.

You must replace the placeholder *newpassword* with a new password of your choice.

A message appears indicating that the operator password has been successfully set.

Connector Issue Prevents Administrator Access to Application Manager

An IdP Discovery configuration issue might make Application Manager inaccessible. You can create a temporary administrator to access Application Manager, where you can add an identity provider, which generates an activation token for another Connector instance.

Problem

A Connector instance is unreachable, which prevents you from logging in to Application Manager as an administrator or as a user.

Cause

The Identity Providers page in the Administrator Web interface is misconfigured. A potential issue is that a Connector instance becomes non-functional or you accidentally delete the instance.

Solution

1 Create a temporary administrator.

a Use a browser to access http://*MyOrg*.*MyDomain*.com/SAAS/login/0.

b Log in as an operator.

c Click the name of the appropriate organization in the **Organizations** tab.

d Click **Add Temporary Administrator User**.

e Complete the text boxes and click **Submit.**

This action generates an email message that is sent to the address you provided. The email includes a link to Application Manager and a username and password. You can use that link or the following URL http://*MyOrg*.*MyDomain*.com/SAAS/login/0 to access Application Manager until you configure another Connector instance. Once you configure a new Connector instance, you can use the following short URL to access the Connecter: http://*MyOrg*.*MyDomain*.com/.

2 Generate a new Connector activation code.

a Use a browser to access http://*MyOrg*.*MyDomain*.com/SAAS/login/0.

b Log in as the temporary administrator with the information provided in the email message.

c Navigate to the Identity Providers page by selecting **Settings > Identity Providers**.

d Click **Add Identity Providers**.

3 Complete the text boxes and click **Save.**

4 Copy and save the Connector activation code for use when you configure a Connector instance.

5 Install another instance of the Connector and use the activation code you just received.

Using a Static IP Address for Application Manager with vCenter Server Can Result in an Access Issue

If you use vCenter Server to deploy Application Manager Appliance using a static IP address and an access issue occurs, a specific misconfiguration might exist.

Problem

Either you cannot access the Operator Web interface, or if you catch the problem earlier, you realize when you configure the Access Manager virtual appliance that Application Manager is using a DHCP IP address instead of the static IP address that you provided when you deployed the virtual appliance.

Cause

You did not configure the respective vCenter Server IP pool correctly. This setting overrides the configurations you made while deploying the virtual appliance. Therefore, when you deploy the Application Manager virtual appliance, even though you set the IP allocation policy to Fixed and provide a static IP address, Application Manager uses a DHCP IP address instead.

Solution

1 Return to vCenter Server and Configure the respective IP Pool to use static IP addresses.

2 Deploy the Application Manager virtual appliance again, setting the IP allocation policy to Fixed and providing the static IP address for the virtual appliance.

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